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Q&A: On the Making of the Federal Budget

Science Funding Faces a "Zero-Sum Mentality"

The federal budget stands at a historic $1.1 trillion. Nevertheless, numerous scientific aspirations are gasping for funds. The obvious reason is that "there's not enough money to go around," as NSF Director Erich Bloch, echoing the current mood in Washington, said in an SGR interview September 15. The causes of the insufficiency are embedded in the mechanics and politics of federal budget-making, a recondite enterprise understood by very few, in or out of government. One in the know is a senior Congressional staff member closely involved with federal research budgeting for over a decade. On the condition of anonymity that usually accompanies candid talk by legislative aides, he spoke with SGR Editor Greenberg on October 3. Following is the text, transcribed and edited by SGR.

Q. With all that money in the federal budget, why is it so hard to get more for anything, including science?

A. When the budget is put together, you're dealing with a zero-sum mentality that's created by Gramm-Rudman. Because, if you add something in one place, it has to come out somewhere else. Even though Gramm-Rudman is "leaky," it still has a strong effect.

Q. Is the likelihood for big increases in spending then virtually nil?

So Much for Science Education—P. 3
New Eruption in Baltimore Case—P. 5

A. As long as the situation continues the way it is, it is very difficult to think seriously of great growth in any of these accounts. One example is the trip to Mars. The numbers you hear are $400 billion in real dollars over the next 30 years. That would require perhaps a tripling of the NASA budget over five to ten years from now. That's another $20 billion to $30 billion a year for NASA. That's not on anyone's horizon. We may be in a logjam, where you can't really change things, because you can't get people to agree on how to pay for them.

Q. Can the jam be broken without a tax increase?

A. You could have other resolutions, a higher deficit, for example. Or lower spending. But there's no coalition for higher taxes or for spending restraint.

Q. Most of science is in the "discretionary" part of the federal budget, and that's recognized as a tough place to be. What's the discretionary budget and what's the problem with being there?

A. There are two parts to the budget: Discretionary, which means a year-to-year appropriation. And within discretionary, there's non-defense and defense. Then there's so-called non-discretionary, better known as mandatory payments or entitlements—laws that say that money must be paid for this or that: Social Security payments, agricultural price supports, and so forth. Basically, when something is mandatory, the burden of change lies in the Congress. That's difficult, because it's hard to cut something that people think they're entitled to. So, obviously, if you can get an entitlement, it's a tremendous advantage, because you're not in a year-to-year review of your budget.

Q. Where are the science programs?

A. All discretionary. In fact, all R&D programs in the government, defense, health, and others, are discretionary.

Q. After you subtract the money that is non-

(Continued on Page 2)

In Brief

White House Science Adviser D. Allan Bromley is pursuing good relations with the science powers on Capitol Hill, a group disdained by his two Reagan-appointed predecessors. Bromley spent a cordial half hour in private conversation on September 25 with Senator Edward Kennedy, Chairman of the Labor and Human Resources Committee, which has authority over biomedical research. The meeting, in Kennedy's office, concluded with mutual pledges of cooperation.

Bromley has also been responsive to invitations to testify before the many subcommittees with a piece of science jurisdiction. His predecessors, annoyed by the burden of testifying, sometimes sent excuses and subordinates. On October 3, Bromley testified at a hearing on supercomputers held by the House Subcommittee on Science, Research and Technology, whose ranking Republican, Rep. Sherwood L. Boehlert (NY), greeted him with: "It's good to have a science adviser who's more than a cheerleader for SDI."

The pace of staffing for Bromley's office remains slow. For the four Presidentially appointed Associate Director slots, only two nominees have been announced by the White House: James B. Wyngaarden, whom the Bush crowd ironically forced out in August as Director of NIH, and H. Thomas Ratchford, Deputy Executive Officer of the AAAS.

Another long-lingering appointment is reported to be on the brink of an announcement: John W. Lyons to Director of the National Institute of Standards and Technology, where he now directs the National Engineering Laboratory.

A new requirement for members of NIH peer-review study sections: A signed pledge to comply with conflict-of-interest and confidentiality regulations.

. . . "Discretionary" Funds Draw Many Competitors

(Continued from Page 1)

discretionary,i.e., the money that is spoken for at the beginning, what slice of the pie is left for all the discretionary items?

A. Almost 50 percent of the budget, on a year-to-year *spending* basis. But if you look just at the *outlays*, it's more like three-quarters of any year's outlays are non-discretionary, in the following sense: say you appropriate something on the order of $550 billion every year. Of that, the outlays that accompany that appropriation are on the order of $290 billion. That's because there's always a lag in the spending. Out of the $1.1 trillion in the budget that's being spent this year, maybe $290 billion is truly discretionary in this year.

Q. What are the activities that share in this $290 billion?

A. Almost all of defense. However, a lot of it is non-discretionary in the sense that you're not going to fire the troops. So, even though that is called discretionary, because you can change it, the fact is that you really can't. Just like the payrolls of the Department of Energy and NSF. You're not going to fire 50 percent of them. Even though it's called discretionary, it's not. One has to share that $290 billion in outlays with almost all of defense, all of NASA, almost all of DOE, all the regulatory agencies in the government, most of the Departments of Education, Labor, and Commerce. It's just about everything. Now, remember, Gramm-Rudman requires reductions in the deficit, in theory, of $36 billion a year. And the $36 billion must come out of the discretionary part of the budget.

Q. The science budgets appear to be in a vise, pressed by Gramm-Rudman and competitors for a limited amount of discretionary funds.

A. Right. The way it works is that at the beginning you have a pot of money that's going to go to the Appropriations Committees for the discretionary programs, those which get funds on a year-to-year basis. That pot gets fixed in the budget resolution. The amount in the pot is determined by considering the Gramm-Rudman target for that year and what can you do about permanent legislation—entitlements, user fees, taxes—as well as appropriations, so that the total deficit forecast comes down to the desired amount. The process takes into account the President's budget, including its response to Gramm-Rudman, because he also has to end up, presumably, with a target that satisfies Gramm-Rudman.

The budget resolution, in theory, is where you can make the tradeoffs between permanent programs and discretionary programs. Once that discretionary program pot is settled on, then everything follows from there. The full Committee on Appropriations is told how much it will get in budget authority and outlays and it divvies up that pot among its subcommittees. The chairmen of the 13 appropriations subcommittees and the chairman of the full committee go through an elaborate negotiation process to take the lump allocation they get from the Budget Committee and divvy it up among the subcommittees.

One further thing that's happened in the last two or three years is the so-called summit agreement. As these pots of discretionary money started becoming increasingly tight relative to the desires of the public for funding of various programs, the Reagan Administration said it was concerned that defense—because it's such a big item—is going to take a worse cut. Because you can always take a billion or two or five from defense to take care of discretionary programs. So, they said we need to protect defense, and also foreign policy. And they said everything else is non-defense discretionary. For the three years running that there's been a summit agreement, fiscal '88, '89 and '90, that's been the format.

Q. Are the federal science programs grouped together?

A. No, but a lot of them are in what's called budget Function 250, which is basically all the National Science Foundation, about 92 percent of NASA, and the part of the Department of Energy that deals with high-energy and nuclear-physics programs. Function 250 has done reasonably well. NASA has gone up considerably over the last eight years, but not any where near as much as the Reagan or Bush Administrations have wanted. NSF is up considerably, and DOE general science is up, after having gone down in the middle of the period. But when you look at these agencies *vis-a-vis* their announced plans and requests, they haven't done so well. Relative to the past, it's a good situation. Relative to the requests, they haven't done well at all.

Q. Why?

A. The NASA budget, to give you an example, was at $11 billion in fiscal 1989. The Administration's request for 1990 is $13.3 billion. The Congressional Budget Office reported last year that just to complete the announced plan for the Space Station in 10 years, the budget request would have to go up to over $18 billion a year in the next four or five years. Remember, the NASA budget was about $8 billion three years ago. Even though it's experienced significant growth, it's nothing compared to what it has to go to if the announced program is to be fulfilled. These large increases are being sought at a period when non-defense discretionary spending

(Continued on Page 3)

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NSF Director Opposes Boost in Education Funds

Even before the pieties of the Charlottesville education summit had faded to oblivion, the Director of the National Science Foundation was protesting Congressional efforts to provide extra money for science education.

The protest was expressed in letter dated October 2 from NSF Director Erich Bloch to Barbara Mikulski (D-Md.), Chairman of the Senate Appropriations Subcommittee that handles the NSF budget. Though it's doubtful that Bloch can affect the Congressional outcome, he surely will succeed in inflaming the science-education community's paranoia about NSF's priorities.

For fiscal 1990, the Administration had requested a total of $2.149 billion for NSF, including $190 million for the Foundation's Science and Engineering Education Directorate. The work of the Directorate—curriculum research and innovations, teacher training, etc.—is one of the smallest items in the NSF budget, but it's popular with Congressmen because it puts money into locally appreciated elementary- and secondary-school activities.

As has often happened in recent years, the Appropriations Subcommittees substantially cut the overall request for NSF (by $150 million in the House and $86 million in the Senate), while increasing funds for the Education Directorate. For that account, the House added $20 million, while the Senate held its largess to $10 million.

Bloch's letter predictably called for restoration of the cuts, mostly concentrated in the NSF account for Research and Related Activities. But it also sought to roll back the relatively minor increases for education. "Since FY 1987," he wrote, "obligations for Science and Engineering Education have increased by almost 92 percent when compared to the request for FY 1990."

What he didn't mention was that in the early days of NSF, science education was co-equal with research in shares of the budget. It lost out when hard-science researchers, dominant in the politics of NSF, grabbed money that they felt was being squandered on science games for school kids. The Reagan Administration carried the theme to the ultimate by terminating the Education Directorate, which it later cheerfully resurrected, amid self-congratulations, when science education became a trendy political issue.

Continuing with his bizarre opposition to the increases for science education, Bloch wrote, "The Foundation has set out a long-range plan that provides substantial increases for these important activities." Referring to the forthcoming House-Senate conference to harmonize the two money bills, Bloch wrote, "I ask the conferees to consider the impact these large increases will have on our ability to execute a sound long-range plan and to effectively manage these long-range programs."

The raising of doubts about "our ability... to effectively manage..." more money for education was a non-subtle slap at the education's community's capacity for making good use of NSF's precious funds. The educators insist that the quality of their work is the equal or better of any supported by the Foundation. Nonetheless, maybe because of the high political priority now held by science education, the field is often denigrated in the research wings of NSF, and its presence and resources are regarded as a kind of hush money to satisfy Congressional passions.

Budget

(Continued from Page 2)

is not likely to go up considerably. You've got a huge amount of potential demand colliding with a fairly slow-growing envelope.

Q. For appropriations, NSF and NASA are grouped in the same subcommittee with veterans and housing and a bunch of regulatory agencies.

A. It so happens that NSF and NASA are competing with the Department of Veterans Affairs and Housing and Urban Development, EPA and others. But regardless of where they would be, they'd still have a problem. People have focused on the fact that NASA and NSF have put in great requests for growth and so has the VA. Reagan and Bush have both sought large reductions in EPA and HUD programs. For the VA, the requests were nowhere near the growth that was required by program or by political necessity. The Congress did not go along with these proposed reductions. But it looks to some that when NASA and NSF get increases, it's at the expense of HUD, VA, and EPA. And as far as NSF and NASA are concerned, it looks like they're suffering from the increases in the other agencies. It sets up a very poor dynamic in that bill, since the overall appropriation has to stay within a given target or decline for that matter.

Q. This presupposes that there will not be any substantial increase in tax revenues.

A. If more money were coming in, you could afford to spend more and at the same time reduce the deficit.

Q. The Superconducting Super Collider was voted a startup appropriation of $225 million for this year. That's double what it had last year. Where did it come from?

A. In that particular instance, the Energy and Water Development appropriations bill was increased, and the money came out of that. The increase could have been used for any number of things. You can't say that the increase was intended for the SSC. The increase for the SSC was only $125 million in a bill that totaled $18 billion. But in the future, as the requests increase significantly, to $880 million to $900 million a year, it will harder to find the money.

Q. Gramm-Rudman is turning out to be very porous. There are many devices for getting around it.

A. Absolutely. But the devices come from desperation, as opposed to planning. A budget is set forward at the beginning of the year with the assumption that those tricks will not be done. What happens is that you have a series of

(Continued on Page 4)

. . . Science Can't Count on a "Peace Dividend"

(Continued from Page 3)

maneuvers that occur as last-minute gambits to try to make everything fit around an artificial target. But it still creates a situation where programs can't plan, because they don't know whether a gambit will be successful or not. It's a very unsatisfactory way to go about this process.

SGR. *What are examples of the gambits?*

A. In the last couple of years, there's been increasing use of what we call obligation delays. Basically, that says we cannot obligate money in a program until six or nine months into the fiscal year, as a way of reducing the outlays that will occur in a given fiscal year. Another kind of gambit is the Administration's switching of a military pay day from the beginning of the new fiscal year back to the end of the old year. On paper, that "saves" $2.9 billion in fiscal 1990 by worsening the deficit in fiscal '89.

SGR. *NIH has continued to receive good budget growth. How does it ride above these problems?*

A. The Administration usually doesn't recommend any increases and then NIH ends up with Congress giving it an 8-9 percent increase. That's different from the 20-30 percent increases NIH used to get. Secondly, the bill that includes the NIH budget, the Labor-Health and Human Services bill, is an enormous bill. More than $155 billion in total, of which nearly $50 billion is discretionary. By a realistic measure, the Labor-HHS bill is second to the Defense bill. An 8 percent increase for NIH is on the order of $500 million to $600 million. That kind of increase in that bill is not so big, in terms of discretionary programs. Also, humans are vulnerable to disease, and everyone likes NIH.

SGR. *Clients of the science agencies, along with many others, are hoping that as the Cold War winds down, defense money can be redeployed to their sectors.*

A. First, it's going to be very hard to reduce significantly the rate of growth in DOD. Remember, so far, defense has not been cut; it's just growing slower. But even the reductions in the rate of growth are going to be hard to get, only because there's so much momentum within the system. Second, whatever "peace dividends" there are, that and more than that will be needed to meet deficit targets. Third, budgeting in Congress does not work as simply as taking stuff out of one place and putting it into another. It's very, very complicated. The tradeoffs occur at all stages of the system—when the Administration prepares a budget, when Congress gets it. Just because people can identify a number of savings, and at the same time identify a group of desired increases, doesn't mean that you can translate those savings into increases.

From a big picture point of view, if you save a substantial amount in defense, more funds will become available for non-defense. But it is not a one-to-one relationship.

SGR. *Where have there been real areas of growth?*

A. Even defense saturated out, hit the highest total in real dollars, in '86. In nominal terms, it's continued to grow. NASA has continued to grow significantly. NSF has grown. Again, that's historic growth, but that doesn't measure up to the plans that some people have. You have a situation in NASA where the plans call for significant increases for the space station, but they have not been met by the Congress. The result is that many people in NASA feel that there's hasn't been growth, because the space station is lagging substantially behind the plan. NSF had a plan for doubling in five years, but it has not occurred. And as best as we can tell, it will continue not to occur. That doesn't mean they haven't done well. Relative to inflation and other agencies, they've done well. Relative to what they want, they've really underperformed.

SGR. *If somebody wanted to wave the magic wand and put money into education, where could it come from?*

A. It could come from a bigger deficit or from tax increases, neither of which is politically attractive today.

SGR. *How has growth been accomplished when Gramm-Rudman requires you to reduce the budget every year?*

A. That's what you call the leaky bucket. Gramm-Rudman has not been lived up to. One of the reasons is the devices that have been used to get around it. There have been a whole set of programs and requirements added to the budget over the last year, with no specific way of funding them. Education is one. In drugs, they're taking money across the board as a way of funding the increase for drugs: 0.43 percent from all other programs. That's the Senate arrangement. We still have to see what the House will do with it. And the Administration has blessed it. At least, that's an honest budgeting way of doing it, in the sense that, yeah, we'll spend more for drugs, but we have a way to pay for it.

SGR. *So, this tithing method is one way of doing it.*

A. Yes. That's essentially a minor form of sequestration. It's basically saying, we can't agree how to get the money, therefore we'll take it from everybody.

SGR. *You bring up the feared word "sequestration." When the final work is done on the FY '90 budget, is there a possibility that the sums will be over the target and sequestering will be required?*

A. Yes. Sequestering will go into effect on October 16, because it's very unlikely that Congress will be able to enact a reconciliation bill [legislation for entitlement cuts, taxes, and user fees] and all the appropriations bills by then. The date of the so-called snapshot was October 1. The sequestering stays in effect until Congress can remove it by law. It has to pass a law to remove it. The reason a sequestration will occur is that by October 10, the Administration and the Congressional Budget Office will have to say what the deficit is going to be. And, based on that snapshot, on October 16 an order will be issued by OMB saying cut everything back, by a preliminary estimate of 5.3 percent for civilian and 4.3 percent for defense.

SGR. *That will eliminate growth from almost all pro-*

(Continued on Page 5)

Rockefeller U. Faculty Cool to President Baltimore

David Baltimore was back on the public stage this month following disclosure of substantial opposition on the Rockefeller University faculty to an invitation for the Nobel laureate to become President of the institution.

The melee at the prestigious "Rock" thus further lengthens a grotesquely unpleasant affair that could have been nipped in the bud three years ago if Baltimore and his colleagues hadn't brushed off a young postdoctoral fellow who expressed solid reservations about portions of a paper they co-authored. In its long Washington run, the case is notable for its erosion of Congressional confidence in science's capacity for self-policing.

The outcome of the Rockefeller offer, a senior administrator there told SGR last week, is up to Baltimore, who visited the New York City campus on October 10 to confront the opposition. The Board of Trustees, which made the offer, is standing by its choice, despite faculty opposition, the administrator said, and it's expected that Baltimore will make his decision known no later than the end of this month. Baltimore, who heads the Whitehead Institute at MIT, would succeed Joshua Lederberg, who will reach Rockefeller's compulsory retirement age of 65 in June.

Most of the dissenting savants at Rockefeller clammed up after their distress was lengthily reported on October 10 on the front page of the *New York Times*. Their number has not been made public, but a staff member at Rockefeller estimated to SGR that half of the approximately 50 tenured professors are opposed to the appointment.

From the *Times* account and various other sources, it is clear, as might be expected, that the opposition to Baltimore's candidacy arose from his stonewalling stance in the celebrated and long-running dispute over the accuracy of a paper he co-authored in *Cell* (SGR, October 1: "NIH Enlarging Panel for Reopened Baltimore Case").

Baltimore's contributions to the paper have not been questioned, but when doubts arose about the portion provided by a colleague, Thereza Imanishi-Kari, now of Tufts University, Baltimore, the best known of the authors, publicly stepped forward as defender of the collective work.

After a lengthy investigation, an NIH panel reported in December that it had found "no evidence of fraud, conscious misrepresentation, or manipulation of data." But it said it did find "serious errors of misstatement and omission, as well as lapses in scientific judgment and interlaboratory communication."

Baltimore and his co-authors were directed to publish a correction, and they were admonished by the Director of NIH for their long delay in responding to allegations about deficiencies in the paper. In May, following the second of two hearings by Rep. John Dingell (D-Mich.), NIH said that on the basis of new information concerning the disputed paper, it would reopen the investigation. Throughout the proceedings, Baltimore has maintained the stance of an innocent researcher beset by the ignorant accusations of failed scientists and publicity-craving politicians.

With a final verdict yet to come from NIH, and ferocious John Dingell still pondering the case, the Rockefeller dissidents are plainly motivated by concerns about whether the embattled Baltimore will be good for Rockefeller.

Because it's heavily endowed with its namesake's money, and was once financially self-sufficient, Rockefeller retains the impression of fiscal autonomy. But the presentday Rockefeller University—a wholly graduate institution which collects no tuition—is actually heavily dependent on outside sources for some three-quarters of its annual budget, currently about $100 million. Half the budget comes from federal agencies, a quarter from private gifts, foundations, and industrial sources, and only one-quarter from the Rockefeller endowment. In recent years, the university has been running small deficits.

The money situation apparently figured to some extent in rousing faculty opposition to the prospect of a Baltimore presidency. The *Times* report quoted one Rockefeller faculty member, E.G.D. Cohen, a theoretical physicist, as saying, "Suppose that either the Dingell Committee or NIH would find reason to blame him. What would be the public image of us and how would we raise money?"

The realism of that concern about image and money is open to question, given Rockefeller's deeply rooted prestige and Baltimore's numerous admirers, even with the "case" lingering on. But getting research money can be difficult under the best of conditions, and it's easy to see why researchers might feel anxious about a potential handicap in the grants derby.

Cohen was quoted as adding: "Some people think that if the offer had been made to them under these circumstances, they might have said, 'If I really care for the place, I don't want to be considered before this has been cleared up.'"

(Continued on Page 6)

Budget

(Continued from Page 4)

grams.

A. Sure. Once the reductions are set, an order will be issued on October 16, pursuant to Gramm-Rudman, that will put those cuts into effect. As a practical matter, those cuts mean that certain money will be withheld by the agencies. If Congress can, by October 31 or later, enact a reconciliation bill combined with an appropriations bill that would meet the Gramm-Rudman targets, it could lift the sequestration order. Then they could come in and say, okay, we met the target, lift the sequestration. It's a likely outcome, but not certain, by any means.

Three trains are moving at the same time: The appropriations bills, which have yet to be completed, and which have quite a few problems in them. The reconciliation bill, which also has a lot of problems. And the new debt ceiling which has to be enacted before October 31. Those are three difference processes.

. . .*Cell* Dispute Raised Doubts About Judgment

(Continued from Page 5)

Also surfacing in the *Times* account was a theme that has heretofore been present in scientific circles, but that has not been spoken aloud, namely, that Baltimore has displayed poor judgment in handling the allegations about the *Cell* paper. Gerald M. Edelman, a faculty member at Rockefeller, was reported as saying that Dingell would not have held hearings on the case if Baltimore "had simply written a letter to the editor to correct the paper and not decided to become very public."

A similar point was attributed to Anthony Cerami, Rockefeller's Dean of Graduate and Postgraduate Studies. Baltimore, he was quoted as saying, "actually helped precipitate the thing and make it worse for himself and for science in general." To which was added that Baltimore's handling of the case "got him in more trouble than if he had handled it in a straightforward manner from the beginning, and people are using that as a bellwether for his character."

In a rendition of the extravagant rhetoric common in campus skirmishes, Cerami was also quoted as saying, "Unless someone comes in who can lead the faculty and gain its respect, it will be warfare for the next 20 years.It will be an unpleasant place to work in."

The expressions of opposition to Baltimore as head of Rockefeller University bring into the open strong undercurrents of resentment toward his behavior in the *Cell* paper controversy. The previous restraint probably stemmed from a feeling that it would be unsportsmanlike to assail an embattled member of the profession, no matter how eminent. Then there's also the fact that Baltimore is a powerful figure in science politics, sitting on influential committees and boards and widely respected in a variety of important institutions in and around science.

But beyond the backbiting that such eminence attracts, a number of highly respected scientists are just plain dismayed about Baltimore and the *Cell* paper. One of them, a Nobel laureate, told SGR on a non-attributable basis last June that "I have reservations about the paper. Lots of people think, I too, that the broad claim of the paper is wrong." He said he agreed with another scientist's characterization of the paper as "sloppy," and added that "a set of experiments were done, probably sloppily, and others maybe were not done"—which is one of the allegations under investigation by NIH and the Dingell committee. The same scientist also said he felt Baltimore and allies had sought to obscure the dispute about the paper by raising the "issue of Congress attacking science." He said he deplored this as "a misrepresentation on the public."

Another scientist, a member of the National Academy of Sciences who is on the faculty of a major university, told SGR—also on a non-attributable basis—that "Baltimore's extraordinary claim (in the *Cell* paper) is almost certainly wrong. The tragedy," he added, "is David's refusal to admit what anyone else would admit." Asked about assertions by Baltimore and several colleagues that the "central claim" of the paper has been replicated, this scientist said: "That's a goddamn lie."

Where's the Replication?

Has the controversial *Cell* paper co-authored by David Baltimore been replicated by other researchers? The question has figured large in the marathon dispute, because if the paper is correct in its breakthrough conclusion, the details of the research process become less important.

While leading the defense of the paper, Baltimore himself has been extremely cautious on the issue of replication of the "central claim," which all agree concerns whether genes introduced into an organism can influence the expression of native genes. At a hearing last May before Rep. John Dingell, Baltimore testified that "no result of the paper has been proved wrong. A number of results have been replicated. Significant progress has been achieved by scientists building on the paper's conclusions."

However, one of his strongest supporters in the case, Professor Henry Wortis, of Tufts, went the limit on the issue. Wortis, who investigated the case for Tufts—and dismissed the charges of serious errors and baseless conclusions as unfounded—testified to Dingell:

"Some of the experiments have been done. I am aware of that, and there is—in fact, the central conclusions have been confirmed. Those have not yet been submitted for publication, however." In his testimony, Wortis repeated that point, stating that "some of the original observations have been independently confirmed, though they have not yet been published."

That testimony was given five months ago. Last week, SGR asked Wortis for the whereabouts of the publications confirming the central claim. He replied, "I will not comment on an unpublished paper."

Meanwhile, there is a published paper that partially addresses the issue of replication, in the September 15 *Journal of Immunology*, by a group at Brandeis University, with Satyajit Rath as lead author. Referencing the Baltimore paper, it states in its conclusion: "These results contrast with those of another study with another transgene. . . . Our data reveal no such idiotypic mimicry by endogenous molecules. . . ." Wortis did comment on that to SGR, saying that "they used a different gene."

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In Quotes: On Wooing the Public to Nuclear Power

From "Engineering in an Age of Anxiety: The Search for Inherent Safety," an address to the 25th annual meeting of the National Academy of Engineering, October 4 in Washington, by Alvin W. Weinberg, Institute for Energy Analysis, Oak Ridge Associated Universities, former Director, Oak Ridge National Laboratory.

The public's views are, in this age of television, strongly affected by skeptical and articulate elites. These are self-appointed spokesmen for the public interest as they conceive it. Though these elites are often anti-technological, many of them are sufficiently sophisticated to see tradeoffs in any assessment of a technology's risk. Thus, shortly after Chernobyl, Jan Beyea [Senior Staff Scientist] of the [National] Audubon Society admitted before a Senate committee that in view of the greenhouse warming, nonfossil energy sources would be needed. Though solar was his favorite, he recognized that solar was expensive. He therefore urged development of inherently safe nuclear [which Weinberg defines as depending on "inherent and passive characteristics," with which a harmful failure would require "some all-but-incredible circumstances"]. . . .

So, I think the nuclear community must address the skeptical elites. The engineering task is to design reactors whose safety is so *transparent* that the skeptical elite is convinced, and through them, the public.

What the public requires by way of assurance will depend on the alternatives, and here the greenhouse effect may be decisive. To counteract the greenhouse effect, I have estimated that the world, by mid-twenty-first century, may have to deploy around 5000 very large reactors. . . .

The notion of inherent safety seems to have political appeal. For example, the Italian Parliament, though putting an end to nuclear power after Chernobyl, has authorized a five-year study of inherently safe reactors as a possible way to bring nuclear back to life. Mikhail Gorbachev has called for the development of inherently safe nuclear reactors. . . And Michael Dukakis. . . promised to oppose construction of new commercial reactors "until a new generation of reactor design and safety control is developed". . . .

William C. Clark (1979) reminded us in his famous paper, *Witches, Floods, and Wonder Drugs*, that much of today's anxiety over technology is as little justified as was the fear of witches that swept over Europe in the 15th, 16th, and 17th centuries. But people eventually overcame their fear of witches. According to Hugh R. Trevor-Roper (1969), the public relaxed after the intellectuals ("skeptical elites") of the time decided that witches were not as bad as their reputation, and then decided to regard witches as more or less benign. I do not say that today's technologies are always as benign as witches; the general anxiety engendered in part by real catastrophes, in part by imagined catastrophes, has pushed the public's estimate of how safe is safe enough much further toward safety than most engineers would judge sufficient. But in this the public's voice is supreme; we as engineers have little choice but to respond to these concerns. Inherent or at least transparent and passive safety offers us a technical fix for the public's anxiety.

Weinberg's address is contained in the NAE's 25th anniversary symposium proceedings, *Engineering and Human Welfare* (43 pp., no charge), available from: NAE, Program Office, 2101 Constitution Ave. NW, Washington, DC 20418; tel. 202/334-1691.

In Print

(Continued from Page 8)

sion of scientific methodology and then moves on to ethical problems that can occur in the lab, including fraud, plagiarism, undeserved authorship credit, plus the perils and techniques of "whistle-blowing." Produced by the Academy's Committee on the Conduct of Science, chaired by Francisco Ayala, UC, Irvine, the booklet opts for goodness in all cases. It does so, however, in a high-school civics-textbook tone likely to seem naive to students who have tasted the grant-grubbing realities of contemporary research.

Order from: National Academy Press, 2101 Constitution Ave. NW, Washington, DC 20418; tel. 202/334-3313 or 1-800-624-6242.

Two Share NAE $350,000 Prize

Breaking into the big leagues of prizes, the National Academy of Engineering awarded its new Draper Prize on October 3—and got a no-show for half of the $350,000 award. The prize, in recognition of the invention of the integrated circuit, was shared by Jack S. Kilby, who was on hand for the ceremony. Absent was Robert N. Noyce. NAE President Robert White explained that the winners were kept confidential until a few days before the ceremony, and Noyce was unable to rearrange his schedule.

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The publications listed are obtainable as indicated—not from SGR.

Science and Technology Resources in US Industry (NSF 88-321, 103 pp., no charge), first of a new NSF series focused on science and technology in major sectors of the US economy, illuminated by selected comparisons with France, West Germany, Japan, and the UK, with data in many instances going back to 1965. Topics covered include R&D expenditures, high-tech trade balances, productivity, scientists and engineers in the workforce, etc. The volume, pulling together a good deal of previously scattered statistical material, offers the best available numbers. But given the doubts recently raised about the quality of many important federal statistical series (SGR, October 1, 1989, "Federal Economic Data Faulty, OTA Study Says"), caution, if not skepticism, may be in order in using the data.

Order from: NSF, Division of Science Resources Studies, 1800 G St. NW, Washington, DC 20550; tel. 202/634-4634.

OECD Science and Technology Indicators Report No. 3: R&D, Production and Diffusion of Technology (132 pp., $42), latest statistics (inviting a repeat of the above caution on NSF's) on R&D and associated activities in the 24-nation Organization for Economic Cooperation and Development.

Order from: OECD Publications and Information Center, 2001 L St. NW, Suite 700, Washington, DC 20036-4095; tel. 202/785-6323. Also available at bookshops and OECD offices in major cities throughout the world.

High-Performance Computing & Networking for Science (GPO Stock No. 052-003-01164-6, 36 pp., $2.25, plus 25 percent for international orders), background paper by the Congressional Office of Technology Assessment, requested by the House Science, Space, and Technology Committee and the Senate Committee on Commerce, Science, and Transportation, both pushing legislation for national networks of high-speed computer "highways" integrated with mega-data banks. OTA, which is working on a major report on this subject, says in this *hors d'oeuvre* that there's a lack of clearcut federal policies and financial commitment in this area.

Order from: Superintendent of Documents, USGPO, Washington, DC 20402-9325; tel. 202/783-3238.

Materials Science and Engineering for the 1990s: Maintaining Competitiveness in the Age of Materials (294 pp., $39.50), report by a National Academy of Sciences panel chaired by Praveen Chaudhari, of IBM, and Merton C. Flemings, of MIT, this is intended as a landmark review of materials R&D and applications in the US. The panel says that between 1976-87, support by the major federal agencies declined by a real 20 percent. Among the recommendations: "substantially increased expenditures on facilities for synthesis and processing research in universities and other laboratories for use by individual investigators and small groups of investigators." Also: "establishment of major national centers for synthesis and processing, involving universities, industry, and government."

Investing in Research: A Proposal to Strengthen the Agricultural, Food, and Environmental System (155 pp., $20.00), another big report from the Academy, this one, by its Board on Agriculture, chaired by Thomas L. Hullar, UC Davis, asserts that research sponsored by the US Department of Agriculture has been financially and intellectually stagnant for 25 years, and recommends that spending on USDA competitive research grants should be upped from the present $50 million to $550 million. Indulging in the kind of pipedreams currently popular in Gramm-Rudman Washington, the Board says the money "could come from sacrificing other USDA research programs," from funds now allocated to commodity price supports, or "from other parts of the federal budget." The report notes that USDA research grants average $50,000 apiece, while NSF's stand at $71,000 and NIH's at $154,900.

On Being a Scientist, also from the Academy, (22 pp., $5 each, lower for multiple copies), "intended for students," this booklet provides a broad but superficial discus-

(Continued on Page 7)

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